

Continental Shelf Embayments of the Eastern Margin of the Philippines; Lamon Bay Stratification & Circulation

Arnold L. Gordon
Lamont-Doherty Earth Observatory
61 Route 9W
Palisades, NY 10964-8000
tele: 845 365-8325 fax: 845 365-8157 email: agordon@ldeo.columbia.edu

Award Number: N00014-10-1-0426

LONG-TERM GOALS

To investigate the circulation, stratification and the Shelf-Slope interaction, and the resultant ocean productivity, within embayments of the eastern coast of the Philippines.

OBJECTIVES

The primary objective is to quantify the spatial and temporal ocean processes associated with Lamon Bay, a large embayment of the east coast of Luzon (Figure 1). Lamon Bay extends from the Catanduanes Island from which the irregular coastline runs east-west, spotted with many coral reefs and rich fishing grounds. At the western end is Polillo Island, where interesting ocean color features have been noted. North of Polillo the shelf runs north-south and narrows substantially, with the steep drop into the deep ocean within 10 km of the coast, marking the northern limits of Lamon bay.

Report Documentation Page				Form Approved OMB No. 0704-0188	
Public reporting burden for the collection of information is estimated to average 1 hour per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden, to Washington Headquarters Services, Directorate for Information Operations and Reports, 1215 Jefferson Davis Highway, Suite 1204, Arlington VA 22202-4302. Respondents should be aware that notwithstanding any other provision of law, no person shall be subject to a penalty for failing to comply with a collection of information if it does not display a currently valid OMB control number.					
1. REPORT DATE 2010		2. REPORT TYPE		3. DATES COVERED 00-00-2010 to 00-00-2010	
4. TITLE AND SUBTITLE Continental Shelf Embayments of the Eastern Margin of the Philippines: Lamon Bay Stratification & Circulation				5a. CONTRACT NUMBER	
				5b. GRANT NUMBER	
				5c. PROGRAM ELEMENT NUMBER	
6. AUTHOR(S)				5d. PROJECT NUMBER	
				5e. TASK NUMBER	
				5f. WORK UNIT NUMBER	
7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) Lamont-Doherty Earth Observatory, 61 Route 9W, Palisades, NY, 10964-8000				8. PERFORMING ORGANIZATION REPORT NUMBER	
9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES)				10. SPONSOR/MONITOR'S ACRONYM(S)	
				11. SPONSOR/MONITOR'S REPORT NUMBER(S)	
12. DISTRIBUTION/AVAILABILITY STATEMENT Approved for public release; distribution unlimited					
13. SUPPLEMENTARY NOTES					
14. ABSTRACT					
15. SUBJECT TERMS					
16. SECURITY CLASSIFICATION OF:			17. LIMITATION OF ABSTRACT Same as Report (SAR)	18. NUMBER OF PAGES 5	19a. NAME OF RESPONSIBLE PERSON
a. REPORT unclassified	b. ABSTRACT unclassified	c. THIS PAGE unclassified			

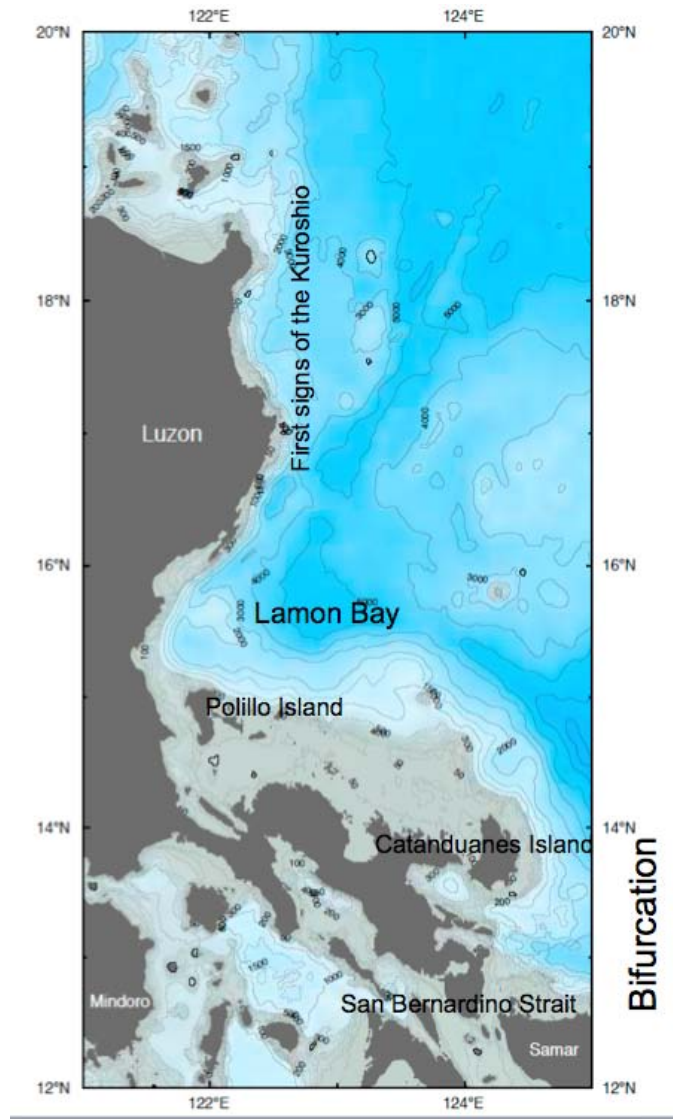


Figure 1 Lamon Bay. The North Equatorial Current ‘runs’ into the eastern margin of the Philippines, where it bifurcates, part heading north to eventually create the Kuroshio, part feeding into the southward flowing Mindanao Current. However, the encounter is not simple as the Philippine eastern coast is rather irregular with island promontories, coastal embayments, many with straits that are linked with the small interior seas of the Philippines.

APPROACH

This program represents a collaboration with Cesar Villanoy, Laura David and their colleagues of Marine Science Institution in the Philippines; with Pierre Flament, University of Hawaii; A. Gordon of Lamont-Doherty Earth Observatory of Columbia University. While the full team will be involved with all aspects of the program and all components are scientifically linked, the Philippines researchers will focus on the marine ecosystem issues, and Flament will focus on the surface layer circulation features as revealed by the HF Radar system and A. Gordon will focus on the hydrographic component- the stratification and circulations of the waters of Lamon Bay, with emphasis on shelf/slope interactions. A

mooring component to obtain a time series of shelf-slope exchange at three positions along the margins of Lamon Bay will be a shared endeavor. (Figure 2).

WORK COMPLETED

The field phase is scheduled on the R/V Roger Revelle from Kao-hsiung, Taiwan 15 May 2011 to Kao-hsiung, Taiwan, 3 June 2011. The team is discussing the details of the Lamon Bay field plan, and acquiring the materials needed to implement the field activity.

RESULTS

The cruise plan and mooring sites [still tentative] are shown in Figure 2.
We will pick up the Philippine research team in Tabaco City.

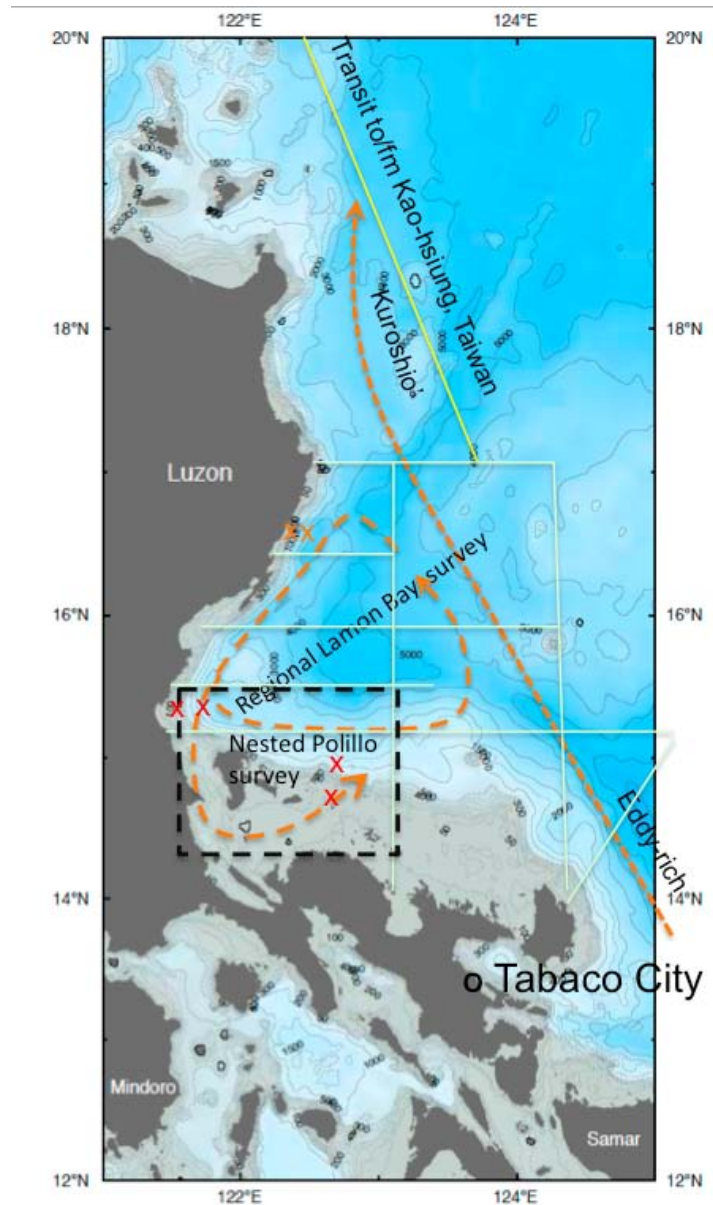


Figure 2 Preliminary plan for the underway data collection sections, along which ship based CTD stations will be obtained. Focus is placed on western and southern components of the slope/shelf break front. The Regional Lamon Bay Survey extends from the inner shelf to the deep ocean, so as to be able to relate the Lamon Bay continental margin conditions within the western boundary regime. A higher resolution survey will be carried out within the Nested Polillo survey box to investigate the ocean color patterns discussed by Cesar Villanoy. The red and orange X marks preliminary positioning of the ADCP moorings. The field phase is scheduled on the R/V Roger Revelle from Kao-hsiung, Taiwan 15 May 2011 to Kao-hsiung, Taiwan, 3 June 2011. The Philippine researchers will be embark and disembark the R/V Revelle during a brief personnel exchange stop in Tabaco City.

The ship-based survey provides 3 snap shot views of Lamon Bay oceanographic conditions. These are tied together by time series observations at 6 moorings deployed as three pairs straddling the shelf/slope break. The preliminary sites are shown in Figure 2. The red X sites are based on ADCP instrumentation presently in Pierre Flament's UH inventory. The orange Xs are two moorings that are part of the Gordon component: an upward ADCP with T/S over upper slope and a T/S only over outer shelf to be deployed near 16.5N. The objective is to determine if changes in the upper slope currents are linked to shelf intrusions. In this northern coastal region of Lamon Bay the shelf/slope margin runs north-south, the shelf is very narrow <10 km. A hypothesis is that as the Kuroshio takes shape the pycnocline shoals along the upper slope (geostrophic adjustment) forcing cool/saline, nutrient rich water onto the continental shelf. As the shelf is narrow, the relative flux of slope water to shelf water volume is high. This water is advected southward with the Lamon cyclonic gyre to support the high productivity characteristics of the region. The time series of the downstream characteristics of the southward coastal flow of the western limb of the Lamon cyclonic gyre will be obtained with the Flament moorings (red Xs).

IMPACT/APPLICATIONS

The spatial and temporal shelf/slope interactions processes within and at the boundaries of Lamon Bay may be instrumental in the formation of the Kuroshio Current and supporting the active marine ecosystem characteristic of Lamon Bay.

TRANSITIONS

None

RELATED PROJECTS

None

REFERENCES

PUBLICATIONS

PATENTS

None